CLAIMS

WHAT IS CLAIMED IS:

1. A mold apparatus for forming a shaped laminate in one step, said laminate comprising a cladding layer and a foam backing layer, said foam backing layer having a perimeter and an edge at said perimeter, said shaped laminate formed in said apparatus, said apparatus comprising:

a) a male mold half matable to a female mold half which open and close with respect to one another to define a mold cavity;

b) an inlet mounted on said mold apparatus for introducing foamable materials into the mold cavity;

c) a plurality of edge folding members carried by one of said mold halves, movable from a retracted position to an extended position, said edge folding members adopted to fold said cladding layer over at least part of said edge of said foam backing layer;

d) a plurality of trim blades, located adjacent said edge folding members inwardly of said cavity, each of said trim blades being sequentially movable by one of a plurality of trim blade actuators, from a retracted position adjacent the cavity to an extended position engaging the other mold half to sever the cladding layer to define the finished shape of the laminate, and back to the retracted position; and

e) at least one driver for opening and closing the mold halves and for moving said edge folding members from the retracted position to the extended position.

2. The mold apparatus of claim 1, wherein each of said plurality of trim blades is movably mounted on one of said plurality of edge folding members.

3. The mold apparatus of claim 1, wherein each of said plurality of edge folding members is inwardly movable by an edge folding member actuator.

4. The mold apparatus of claim 3, wherein the edge folding member actuators are hydraulically, or pneumatically operated.

5. The mold apparatus of claim 1, wherein each of said plurality of edge folding members is inwardly movable by a camming action of a camming surface on each of a plurality of heel blocks located on one of said mold halves, against a camming surface on each of a said plurality of corresponding edge folding members on another of said mold halves, whereby the movement of each of said plurality of edge folding members caused by the camming action causes the folding of the cladding layer over the foam backing layer.

6. The mold apparatus of claim 5 including biasing means associated with each edge folding member to return each edge folding member to a retracted position upon mold opening.

7. The mold apparatus of claim 5, wherein each edge folding member is slidably mounted on one of said mold halves, such that closing of said mold halves with respect to one another causes said camming surfaces on said heel blocks and said camming surfaces on said edge folding members to engage to move the edge folding members upon mold closure.

8. The mold apparatus of claim 1, wherein each of said plurality of heel blocks is located on said male mold half whereby movement of said male mold half into said female mold half causes said camming action to move said edgefold slide inwardly to fold the cladding layer over the foam backing layer.

9. The mold apparatus of claim 6, wherein the biasing means are compression springs.

10. The mold apparatus of claim 1, wherein said inlet for introducing foamable materials into the mold cavity is for introducing solid, partially expanded resin.

11. The mold apparatus of claim 10, wherein the solid partially expanded resin is pre-expanded polypropylene beads.

12. The mold apparatus of claim 10, wherein the solid partially expanded resin is pre-expanded polystyrene beads.

13. The mold apparatus of claim 1, wherein said mold apparatus is adapted to perform a steam-chest molding process.

14. The mold apparatus of claim 1, wherein each of said at least one driver is a mechanical, pneumatic, or hydraulic actuator.

15. The mold apparatus of claim 1, wherein the cladding layer is a layer selected from the group consisting essentially of a textile, a thermoplastic polyolefin sheet, and a polyvinylchloride sheet.

16. The mold apparatus of claim 1, wherein the cladding layer has a backing material selected from the group consisting essentially of crosslinked polypropylene, thermoplastic polyolefin, and polypropylene bonded to the cladding layer prior to being molded in the mold apparatus.

17. The mold apparatus of claim 1, wherein the cladding layer is a bilaminate.

18. The mold apparatus of claim 1, wherein the cladding layer is a trilaminate.

19. The mold apparatus of claim 1, wherein the male mold half and the female mold half are oriented with their openings substantially in a vertical plane.

20. The mold apparatus of claim 1, wherein the male mold half and the female mold half are oriented with their openings substantially in a horizontal plane.

21. The mold apparatus of claim 13, wherein the molding process is adapted to use a crush fill process, wherein the crush fill process utilizes means to partially close the male and female mold halves with respect to one another, means to fill said cavity with expanded bead material as the foamable materials and means to subsequently finish the closing motion to further crush and densify the foamable material aiding to fuse and homogeneous fill said mold cavity.

22. The mold apparatus of claim 1, wherein each of said plurality of trim blades mate are matable against a cutting surface.

23. The mold apparatus of claim 22, wherein said cutting surface is constructed of a heat resistant resin or metal.

24. The mold apparatus of claim 22, wherein said cutting surface is selected from the group consisting essentially of

polypropylene, nylon, polyurethane, aluminum, and stainless steel.

25. The mold apparatus of claim 1, wherein said plurality of trim blades includes at least four trim blades carried by one of said mold halves.

26. The mold apparatus of claim 1, wherein said at least one driver includes a hydraulic cylinder for opening and closing the mold halves and a plurality of hydraulic cylinders for moving the trim blades.

27. The molding apparatus of claim 1, wherein adjacent trim blades overlap one another and are adapted to be sequenced to trim adjacent edges of said cladding layers in alternating movements to allow overlapping of said trim blades at the male mold cutting surface thereby facilitating a complete separation of excess cladding layer.

28. The molding apparatus of claim 1, wherein said molding apparatus is adapted to receive a cladding layer that fully covers a surface of said foam backing layer.

29. The molding apparatus of claim 1, wherein said molding apparatus is adapted to receive a cladding layer that partially covers a surface of said foam backing layer, thereby

leaving a portion of said backing layer uncovered by said cladding layer.

30. The molding apparatus of claim 29, wherein said molding apparatus includes a plurality of compression pins and cores carried by the male mold half moveable by a compression pin actuator in the direction of die draw to a position adjacent said female mold half to compress the cladding layer onto the female mold half whereby the cladding layer is sealed against the female mold half to prevent said foamable materials from migrating under the cladding.

31. The molding apparatus of claim 30, wherein said compression pin actuator is mechanical, pneumatic, or hydraulic.

32. The molding apparatus of claim 1, including an air compressor to compress the foamable materials during introduction into the mold cavity.

33. A method for forming a shaped laminate, said laminate comprising a cladding layer and a foam backing layer, said foam backing layer having a perimeter and an edge at said perimeter, said shaped laminate formed in said apparatus in a single operation, said method comprising the steps of:

a) providing a male mold half matable to a female mold half which open and close with respect to one another to define a mold cavity;

b) providing an inlet mounted on said mold apparatus for introducing foamable materials into the mold cavity;

c) providing a plurality of edge folding members carried by one of said mold halves, movable from a retracted position to an extended position, said edge folding members adopted to fold said cladding layer over at least part of said edge of said foam backing layer;

d) providing a plurality of trim blades, corresponding to said plurality of edge folding members, located adjacent said edge folding members inwardly of said cavity, said trim blades being sequentially movable from a retracted position adjacent the cavity to an extended position engaging the other mold half to sever the cladding layer to define the finished shape of the laminate, and back to the retracted position; and

e) providing at least one driver for opening and closing the mold halves, for moving said edge folding members from the retracted position to the extended position, and for moving said trim blades from the retracted position to the extended position;

f) moving the edge folding members and the trim blades using at least one of said at least one driver to retracted positions;

g) loading the cladding layer onto a surface of the edge folding members adjacent the female mold half;

h) closing the female mold half with respect to the male mold half, using said driver, to form the mold cavity;

i) filling the mold cavity, through the inlet, with the foamable materials;

j) actuating each edge fold slide using at least one of the drivers to the extended position to fold the cladding layer over at least part of the edge of the foam backing layer;

k) actuating each of the trim blades to the extended position engaging the other mold half to sever the cladding layer to define the finished shape of the laminate, and back to the retracted position; and

l) opening the female mold half with respect to the male mold half to withdraw the finished shaped laminate.

34. The method of claim 33, wherein the step of providing each of said plurality of trim blades includes providing the trim blades movably mounted on one of the plurality of edge folding members.

35. The method of claim 33, wherein the step of providing the drivers includes providing a plurality of edge folding member actuators to move each edge folding member inwardly by a corresponding edge folding member actuator.

36. The method of claim 33, including the step of closing the mold halves with respect to one another using said at least one driver, wherein each of said plurality of edge folding members is inwardly movable by a camming action of a camming surface on each of a plurality of heel blocks located on one of said mold halves, against a camming surface on each of said plurality of corresponding edge folding members on another of said mold halves, whereby the movement of each of said plurality of edge folding members caused by the camming action causes the folding of the cladding layer over the foam backing layer.

37. The method of claim 36, including the step of providing a biasing means associated with each edge folding member to return each edge folding member to a retracted position upon mold opening.

38. The method of claim 33, wherein the step of providing the inlet for introducing foamable materials into the mold cavity includes providing the inlet for introducing solid, partially expanded resin.

39. The method of claim 33, wherein the step of providing the mold apparatus includes providing a mold apparatus capable of performing a steam-chest molding process utilizing partially expanded resin.

40. The method of claim 39, including the step of providing steam to the mold apparatus subsequent to the step of filling the mold cavity, through the inlet, with the foamable materials.

41. The method of claim 35, including the steps of partially closing the molds subsequent to filling the mold cavity and then subsequently finish closing the molds to further crush and densify the foamable material aiding to fuse and homogeneous fill said mold cavity.

42. The method of claim 33, including the step of sequentially moving adjacent trim blades that overlap one another to trim adjacent edges of said cladding layers in alternating movements to allow overlapping of the trim blades thereby facilitating a complete separation of excess cladding layer.

43. The method of claim 42, including the steps of providing a plurality of compression pins and cores carried by the male mold half moveable by a compression pin actuator in the direction of die draw to a position adjacent said female mold

half and compressing the cladding layer onto the female mold half using the compression pins to seal the cladding against the female mold half to prevent the foamable materials from migrating under the cladding.

44. The method of claim 33, wherein the step of filling the mold cavity with the foamable materials includes filling the mold cavity with prepressurized foamable materials.

45. The method of claim 33 including the steps of providing an air compressor and compressing the foamable materials with the air compressor as part of the step of filling the mold cavity with the foamable materials.